ABSTRACT OF THE DISCLOSURE

Methods of inducing differentiation of mammalian bone marrow stromal cells into cells of multiple embryonic lineages by contacting marrow stromal cells with precursor differentiation-inducing compounds followed by contacting the partially differentiated precursor cells with specific cell type differentiation-inducing compounds. In one embodiment, the MSC derived precursor cell cultures comprise cells, at least some of which simultaneously express markers that are characteristic of endodermal and ectodermal cell types. In another embodiment, the differentiated cells are insulin-secreting pancreatic islet cells. Precursor differentiation-inducing compounds of the invention include anti-oxidants such as, but not limited to, beta-mercaptoethanol, dimethylsulfoxide, butylated hydroxyanisole, butylated hydroxytoluene, ascorbic acid, dimethylfumarate, and n-acetylcysteine. Endodermal cell differentiation-inducing compounds of the invention include but are not limited to anti-oxidants and growth factors including basic fibroblast growth factor. Once induced to differentiate into a particular cell type, the cells can be used for cell therapy, gene therapy, or both, for treatment of diseases, disorders, or conditions associated with tissues of multiple embryonic origins.